

**US OIL RECOVERY SUPERFUND SITE
WORK PLAN REFINEMENT/MODIFICATION NOTICE**

REFERENCE DOCUMENTS: Remedial Investigation/Feasibility Study (RI/FS) Work Plan, Sampling and Analysis Plan Volume I Field Sampling Plan (FSP), Sampling and Analysis Plan Volume II Quality Assurance Project Plan (QAPP) (all dated December 23, 2015), Site-Specific Background Soil Concentration Calculations, US Oil Recovery Superfund Site (Final Memo submitted to EPA on November 9, 2017).

WORKPLAN REFINEMENT/MODIFICATION NOTICE NO.: AO1-1-6

DATE: January 3, 2018

DESCRIPTION OF REFINEMENT/MODIFICATION:

This Work Plan Refinement Notice (WRN) describes the work proposed to complete Iteration 1 at the Site based on evaluation of the data collected to date and discussion with EPA and TCEQ during the Data Review Meeting held on November 30, 2017. The following proposed work is summarized as: 1) Drilling and sampling of 12 additional off-property soil borings; ; 2) Installation and sampling of three (3) off-property groundwater monitoring wells; 3) Re-development and re-sampling of MW-7; 4) Collection of a groundwater sample for cation/anion analysis from wells MW-7, MW-8, MW-10 and MW-13; 5) Slug testing of six monitoring wells; and 6) Collection of short-term variations in water-level data from transducers. More information and justification for the proposed work is provided below.

Soil Extent Evaluation

Soil concentration data for perimeter borings were compared to preliminary screening values (PSVs) to conduct the extent evaluation. PSVs include conservative risk-based values from the literature and soil background upper tolerance limits (UTLs) provided in the "Site-Specific Background Soil Concentration Calculations, US Oil Recovery Superfund Site," submitted to EPA on November 9, 2017, where applicable. To complete the extent evaluation at the Site, 12 additional soil borings ("delineation borings") (SB-111 through SB-122 as shown on Figure 1) are proposed. A summary of the proposed delineation borings and the PSV exceedances in associated perimeter borings is provided on Table 1. Delineation borings are proposed to define Chemicals of Potential Concern (COPC) concentrations in soil samples adjacent to the primary source areas at the Site (i.e., the historic burial pit, the area west of the warehouse, the northeast slope, etc.). In general, delineation efforts are focused on COPCs that are related to historic Site industrial activities. Delineation is not proposed for compounds that appear at low concentrations in many samples collected at the Site and/or that do not appear to be related to a nearby source area or a historic industrial activity at the Site (e.g., metals such as antimony, beryllium and selenium, and isolated occurrences of some pesticides and SVOCs detected at low levels that do not appear to be attributable to a nearby source area). Further delineation is not possible for soil borings immediately adjacent to the Vince Bayou shoreline (e.g., SB-58, SB-95, SB-57, SB-56, SB-55, SB-54, SB-53 and SB-49), which will be addressed during Iteration 2 sampling. No further delineation is proposed at SB-69 and SB-70, which, as detailed in the RI/FS Work Plan, were installed to evaluate impacts from surface drainage flowing onto the southern portion of the property from off-site. At the delineation soil boring locations, the proposed sample intervals were chosen to correspond with those in which COPCs PSV exceedances were observed in proximal borings (as shown on Table 1). In addition, only the COPCs/analytes that exceeded PSVs within that interval in the associated perimeter borings are proposed for analysis, except for SB-119 and SB-120, where, due to the number of exceedances, the full analyte list for metals, VOCs, SVOCs, Pesticides/Herbicides and TPH is proposed. The full analyte list is also proposed for the soil sample interval at SB-112; the associated perimeter borings were analyzed for arsenic only, as detailed in USOR WRN-AOI-4 dated May 19, 2017. Arsenic will be analyzed in all proposed soil samples.

Groundwater Extent Evaluation

COPC concentrations from on-property groundwater samples were compared to PSVs (typically the Federal Maximum Contaminant Level (MCL)) for the groundwater extent evaluation. Similar to the soil extent evaluation, delineation efforts are focused on COPCs that are related to historic Site industrial activities. Furthermore, delineation is not proposed for compounds that appear at low concentrations in many samples collected at the Site and that do not appear to be related to a source area or historical industrial activity at the Site. Finally, the groundwater extent evaluation considers the hydraulic gradient at the Site that clearly shows that flow in the uppermost water-bearing unit at the Site is towards Vince Bayou. Given those considerations, the extent evaluation for groundwater focuses on the downgradient portion of the Site where concentrations of COPCs exceed PSVs and are associated with the northeast slope source area. COPC concentrations that exceeded PSVs include metals, pesticides and herbicides, VOCs, SVOCs and TPH. Table 2 summarizes the COPC PSV exceedances observed in groundwater samples collected from the perimeter monitoring wells. Three monitoring wells (MW-9, MW-15, and MW-16 as shown on Figure 2) are proposed downgradient of the area encompassed by MW-7, MW-8 and MW-10. For the groundwater samples collected from the proposed monitoring wells, the full analyte list for VOCs, SVOCs, pesticides/herbicides, metals and TPH is proposed.

Re-Development and Re-Sampling of MW-7 and Sampling for TDS and Cation/Anion analysis

A groundwater sample collected at MW-7 contained arsenic at a concentration of 43.9 mg/L. To confirm this initial concentration, which is orders of magnitude different than the concentrations observed in all other monitoring wells, redevelopment and resampling of MW-7 is proposed. MW-7 will be redeveloped and sampled in accordance with procedures outlined in the FSP. The groundwater sample will be analyzed for arsenic only.

The groundwater sample from well MW-13 contained a TDS concentration of 15,200 mg/L. This concentration is significantly different than TDS concentrations observed in other nearby monitoring wells at the Site. In general, TDS concentrations were higher near the bayou and decreased moving away (and upgradient) from the bayou which would be expected based on influence from brackish water in the bayou (Figure 3). However, the TDS concentration in the sample from MW-13, which is located in a central area of the Site, had the highest TDS concentration of any sample collected at the Site. To more fully evaluate the TDS at this location, an additional groundwater sample will be collected and analyzed for TDS, major cations (Ca, Mg, Na, K) and major anions (HCO₃, CO₃, F, SO₄ and NO₃). Groundwater samples will also be collected from MW-7, MW-8 and MW-10 (which also had high TDS concentrations) and analyzed for TDS and major cation/anions.

Slug Testing

The objective of slug testing, as stated in the RI/FS work plan, is to obtain information to estimate the hydraulic conductivity of the uppermost groundwater bearing unit at the Site. Wells suggested for slug testing were selected to account for a range of hydraulic conditions and spatial coverage across the site. The data will be used to estimate groundwater flow velocities, evaluate contaminant transport, and for groundwater classification. Slug testing is proposed for MW-1, MW-5, MW-6, MW-10, MW-11 and MW-13.

As detailed in the RI/FS Work Plan, wells will be slug tested by instantaneously raising and lowering the water level in a well with a slug of known volume. Both slug-in and slug-out tests will be performed at each well. Water levels will be recorded with a pressure transducer and a water level meter. The resulting data will be evaluated considering the water level in the well using AQTESOLV or a similar

software, and the most appropriate test results will be used to estimate the hydraulic conductivity of the groundwater bearing unit in the immediate vicinity of the well.

Groundwater Tidal Effects Study

A groundwater tidal effects study will be performed in MW-7, MW-8, MW-9, MW-10, MW-15 and MW-16. The objective of the study is to evaluate the impact of tidal flux in Vince Bayou on the groundwater bearing unit at the Site. A pressure transducer will be placed in each well and the water levels will be continuously recorded for a period of approximately one week, preferably close to or during spring tide.

After the testing period, the data from the pressure transducers will be downloaded and processed. The data will be compared to water levels recorded at the nearest NOAA tidal station, which is the Manchester tidal station located in the Houston Ship Channel. The data will be evaluated to identify potential groundwater input/influence from the bayou.

RATIONALE FOR REFINEMENT/MODIFICATION:

Soil and groundwater delineation is proposed to complete the extent evaluation for those media. To further evaluate elevated arsenic concentrations at MW-7, re-development and re-sampling is proposed for that well. Groundwater samples will be collected from MW-7, MW-8, MW-10, and MW-13 and analyzed for TDS and cation/anion analysis to more fully evaluate TDS concentrations measured in a groundwater samples collected from those wells. In addition, slug testing is proposed at six monitoring wells to estimate the hydraulic conductivity of the groundwater bearing unit at the Site. Finally, a groundwater tidal effects study is proposed to evaluate the influence of Vince Bayou on the groundwater bearing unit at the Site.

Respondents' Project Coordinator:



Date: 11/13/18

Eric Pastor
Pastor, Behling & Wheeler, LLC

EPA Project Manager:


Raji Josiam

Date: 11/4/18

TABLES

Table 1
Soil PSV Exceedance Summary and Proposed Delineation Borings
WRN AOI-1-6
US Oil Recovery Superfund Site
Pasadena, TX

Proposed Delineation Boring	Objective	Proposed Intervals (depths are feet bgs)	Proposed Analytes	Associated Perimeter Borings	Sample Depth (feet bgs) and Interval	COPC Group	Analyte PSV Exceedances (Proposed Analytes for Delineation Shaded Blue)	PSV (mg/kg)	Sample Concentration (mg/kg)
SB-111	Evaluate extent of COPCs in surface and shallow soil west of SB-1, SB-103O and the historic burial pit	Surface Soil 0-0.5	Metals Arsenic Mercury Pesticides/Herbicides alpha-BHC beta-BHC	SB-1	0-0.5 Surface Soil	Metals	Arsenic Mercury Antimony Selenium No Exceedances No Exceedances	8.43 0.243 1 0.679	40.9 0.337 1.16 0.797
			Metals Arsenic VOCs 1,4-dichlorobenzene		3.0-5.0 Shallow Soil	Pesticides/Herbicides TPH	alpha-BHC beta-BHC No Exceedances	0.0021 0.0026	0.0023 0.003
					37.0-39.0 Subsurface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances No Exceedances No Exceedances No Exceedances No Exceedances		
		Shallow Soil 0.5-5			0-0.5 Surface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Arsenic -- -- -- --	8.43	48.5
					3.0-3.5 Shallow Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances -- -- -- --		
					9.0-10.0 Subsurface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances -- -- -- --		
		Surface Soil 0-0.5	Full Analyte List	SB-103Q	0-0.5 Surface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Arsenic -- -- -- --	8.43	25.8
					2.0-3.0 Shallow Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances -- -- -- --		
					11.0-12.0 Subsurface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances -- -- -- --		
				SB-103R	0-0.5 Surface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Arsenic -- -- -- --	8.43	25.3
					4.0-4.6 Shallow Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances -- -- -- --		
					12.0-13.0 Subsurface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances -- -- -- --		
				SB-103V	0-0.5 Surface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Arsenic -- -- -- --	8.43	44.6
					1.0-2.0 Shallow Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances -- -- -- --		
					9.0-10.0 Subsurface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances -- -- -- --		

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SB-113	Evaluate extent of COPCs west of SB-19, SB-19 and SB-20	Surface Soil 0-0.5	Metals Arsenic Pesticides/Herbicides 2,4-DB 4,4'-DDT alpha-BHC beta-BHC Aldrin Dieldrin Endrin Endrin Aldehyde	SB-18	0-0.5 Surface Soil	Metals	Arsenic	8.43	10.9		
							Selenium	0.679	1.49		
							Chromium	30	38.3		
					3.0-5.0 Shallow Soil	Metals	No Exceedances				
							No Exceedances				
		Shallow Soil 0.5-5	Metals Arsenic Pesticides/Herbicides Aldrin	SB-19			2,4-DB	0.085	0.11		
				3.0-5.0 Shallow Soil	Metals	alpha-BHC	0.0021	0.014			
						beta-BHC	0.0026	0.0074			
						No Exceedances					
				0-0.5 Surface Soil	Metals	Beryllium	1.53	1.58			
		SB-20	Metals Arsenic Pesticides/Herbicides Aldrin			SB-20			Selenium	1.04	1.54
									No Exceedances		
									No Exceedances		
									No Exceedances		
									No Exceedances		
		0-0.5 Surface Soil	Metals Arsenic Pesticides/Herbicides Aldrin	SB-19	3.0-5.0 Shallow Soil	Metals	2,4-DB	0.085	0.12		
							4,4'-DDT	0.03	0.048		
							Aldrin	0.002	0.0048		
					0-0.5 Surface Soil	Metals	Dieldrin	0.052	0.067		
							Endrin	0.013	0.017		
		0-0.5 Surface Soil	Metals Arsenic Pesticides/Herbicides Aldrin	SB-20	3.0-5.0 Shallow Soil	Metals	Endrin aldehyde	0.011	0.017 J		
							No Exceedances				
					0-0.5 Surface Soil	Metals	Selenium	1.04	1.63		
							No Exceedances				
							No Exceedances				
		0-0.5 Surface Soil	Metals Arsenic Pesticides/Herbicides Aldrin	SB-20	0-0.5 Surface Soil	Metals	Aldrin	0.002	0.0039 J		
							No Exceedances				
					0.5-1.0 Shallow Soil	Metals	Selenium	1.04	1.84		
							No Exceedances				
					5.0-7.0 Subsurface Soil	Metals	No Exceedances				
							No Exceedances				
							No Exceedances				
							No Exceedances				

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Pasadena, TX

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SB-114	Evaluate extent of COPCs in surface soils west of SB-26, SB-68, SB-75, SB-76 and the former historic tank farm	Surface Soil 0-0.5	Metals Arsenic Mercury Pesticides/Herbicides Dalapon	SB-26	0-0.5 Surface Soil 3.0-5.0 Shallow Soil 7.0-7.8 Subsurface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Arsenic Mercury Selenium No Exceedances No Exceedances No Exceedances No Exceedances	8.43 0.243 0.679	32.2 0.939 J 1.33
				SB-68	0-0.5 Surface Soil 3.0-5.0 Shallow Soil 7.0-9.0 Subsurface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Selenium No Exceedances No Exceedances No Exceedances No Exceedances No Exceedances	1.04	1.31
				SB-75	0-0.5 Surface Soil 1.0-2.0 Shallow Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Arsenic Selenium No Exceedances No Exceedances No Exceedances No Exceedances	8.43 0.679	57.4 1.7
				SB-76	0-0.5 Surface Soil 1.0-2.0 Shallow Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Beryllium Selenium No Exceedances No Exceedances No Exceedances No Exceedances	1.53 1.04	11.6 1.38
							Arsenic Barium Beryllium Cobalt Manganese Selenium Vanadium No Exceedances No Exceedances Dalapon No Exceedances	8.43 300 1.5 36.1 997 0.679 50 No Exceedances No Exceedances 0.0055 No Exceedances	12.7 390 1.53 43.2 2200 2.8 55.7 0.0062 J
							Beryllium Selenium No Exceedances No Exceedances No Exceedances No Exceedances	1.53 1.04	1.66 J 2.21

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SB-115	Evaluate extent of COPCs west of SB-27, SB-28, SB-77 and SB-78	Surface Soil 0-0.5	Metals Arsenic Mercury Pesticides/Herbicides 4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin beta-BHC Dalapon Dieldrin SVOCs 3,3'-Dichlorobenzidine TPH >C12-C28	SB-27	0-0.5 Surface Soil	Metals	Arsenic Mercury No Exceedances No Exceedances 4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin beta-BHC Dalapon Dieldrin No Exceedances	8.43 0.243 0.043 0.054 0.03 0.002 0.0026 0.052 0.0051 J 0.014 0.077 J	32.8 JH 0.3
					4.0-4.8 Shallow Soil	Metals	Arsenic Mercury 1,2,4-Trichlorobenzene 1,4-Dichlorobenzene No Exceedances	30.4 0.243 0.0033 0.00046 1.2	114 0.671 0.0061 0.027
					8.0-8.6 Subsurface Soil	Metals	Arsenic Mercury Antimony Selenium Thallium 1,4-Dichlorobenzene No Exceedances	30.4 0.243 1 1.04 0.202 0.0046 5.39	186 2.52 1.7 1.17
					4.0-5.0 Shallow Soil	Metals	Manganese Selenium No Exceedances No Exceedances No Exceedances No Exceedances	847 1.04 0.043 0.054 0.002 0.0021 0.0026 0.0014 0.0014 0.0035 0.015 0.0051 0.0018 0.0019	873 1.87
					SB-28	0-0.5 Surface Soil	Selenium No Exceedances 3,3'-Dichlorobenzidine No Exceedances No Exceedances	0.679 0.00081	1.5 0.018
		Shallow Soil 0.5-5	Metals Arsenic Mercury VOCs 1,2,4-Trichlorobenzene 1,4-Dichlorobenzene Pesticides/Herbicides 4,4'-DDD 4,4'-DDE Aldrin alpha-BHC beta-BHC delta-BHC Dieldrin gamma-BHC	SB-77	0-0.5 Surface Soil	Metals	Arsenic Selenium No Exceedances No Exceedances No Exceedances No Exceedances	8.43 0.679 0.0055	26.6 1.61 0.0057 J
					1.0-2.0 Shallow Soil	Metals	Selenium No Exceedances No Exceedances No Exceedances No Exceedances	1.04	1.84
					0-0.5 Surface Soil	Metals	Selenium No Exceedances No Exceedances No Exceedances No Exceedances	0.679	2.1
					1.0-2.0 Shallow Soil	Metals	Selenium No Exceedances No Exceedances No Exceedances No Exceedances	1.5 1.04	14 J 2
					SB-78	Metals	No Exceedances No Exceedances No Exceedances >C12-C28 No Exceedances	0.679 1.5 1.04	

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Proposed Delineation Boring	Objective	Proposed Intervals (depths are feet bgs)	Proposed Analytes	Associated Perimeter Borings	Sample Depth (feet bgs) and Interval	COPC Group	Analyte PSV Exceedances (Proposed Analytes for Delineation Shaded Blue)	PSV (mg/kg)	Sample Concentration (mg/kg)	
SB-116	Evaluate extent of COPCs in surface and shallow soil west of SB-60, SB-61 and SB-92	Surface Soil 0-0.5	Metals Arsenic Mercury Pesticides/Herbicides 4,4'-DDT Aldrin alpha-BHC beta-BHC Dalapon delta-BHC gamma-BHC Toxaphene	SB-60	0-0.5 Surface Soil	Metals	Arsenic Manganese Selenium Chromium Vanadium	8.43 997 0.679 30 50	8.75 1240 1.33 47.1 63.6	
					0.5-1.0 Shallow Soil	Metals	No Exceedances No Exceedances No Exceedances No Exceedances			
					5.0-6.0 Subsurface Soil	Metals	Arsenic Selenium Thallium	30.4 1.04 0.202	67.4 1.4 0.398 J	
					0.5-1.0 Shallow Soil	VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances No Exceedances alpha-BHC No Exceedances	0.0021	0.0029	
					7.0-8.0 Subsurface Soil	Metals	No Exceedances No Exceedances alpha-BHC No Exceedances	0.0021	0.0023	
		Subsurface Soil >5	Metals Arsenic Pesticides/Herbicides alpha-BHC	SB-61	0-0.5 Surface Soil	Metals	Arsenic Nickel Selenium Thallium	8.43 26 0.679 0.142	18.7 26.8 1.25 0.148 J	
					0.5-1.0 Shallow Soil	VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances No Exceedances 4,4'-DDT No Exceedances	0.03	0.037	
					2.0-3.0 Shallow Soil	Metals	Selenium	1.04	1.05	
					6.0-7.0 Subsurface Soil	VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances No Exceedances No Exceedances No Exceedances	1.04	1.42	
					SB-92	0-0.5 Surface Soil	Metals	Arsenic Mercury Barium Selenium Thallium	8.43 0.243 300 0.679 0.142	55.6 0.604 446 J 1.23 0.176 J
					0.5-1.0 Shallow Soil	VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances No Exceedances 4,4'-DDT No Exceedances	0.03 0.002 0.0021 0.0026	0.04 J 0.0032 0.073 J 0.008	
					2.0-3.0 Shallow Soil	Metals	Arsenic Selenium	30.4 1.04	75.3 1.47	
					6.0-7.0 Subsurface Soil	VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances No Exceedances 4,4'-DDD beta-BHC >C12-C28	0.043 0.0026 1.5	0.046 0.0043 120	

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WRN AOI-1-6
US Oil Recovery Superfund Site
Pasadena, TX

Proposed Delineation Boring	Objective	Proposed Intervals (depths are feet bgs)	Proposed Analytes	Associated Perimeter Borings	Sample Depth (feet bgs) and Interval	COPC Group	Analyte PSV Exceedances (Proposed Analytes for Delineation Shaded Blue)	PSV (mg/kg)	Sample Concentration (mg/kg)
SB-117	Evaluate extent of COPCs in surface and shallow soil west of SB-63 and SB-64	Surface Soil 0-0.5	Metals Arsenic Pesticides/Herbicides 4,4'-DDD 4,4'-DDT alpha-BHC beta-BHC delta-BHC Dieldrin Endrin Aldehyde gamma-BHC TPH >C12-C28	SB-63 Tidal	0-0.5 Surface Soil	Metals VOCs SVOCs Pesticides/Herbicides	Selenium No Exceedances No Exceedances 4,4'-DDD 4,4'-DDT alpha-BHC beta-BHC delta-BHC Dieldrin gamma-BHC No Exceedances	0.58 0.043 0.03 0.0021 0.0026 0.0014 0.0031 0.0014	1.32 0.06 0.49 0.73 0.06 0.035 0.0063 J 0.14
		Shallow Soil 0.5-5	Metals Arsenic Mercury Pesticides/Herbicides 4,4'-DDD 4,4'-DDT Aldrin alpha-BHC beta-BHC delta-BHC Dieldrin gamma-BHC		3.0-4.0 Shallow Soil	Metals VOCs SVOCs Pesticides/Herbicides	Arsenic Mercury Antimony Cadmium Selenium No Exceedances Pentachlorophenol 4,4'-DDD 4,4'-DDT Aldrin alpha-BHC beta-BHC delta-BHC Dieldrin gamma-BHC No Exceedances	30.4 0.243 1 1 1.04 0.0004 0.043 0.077 0.002 0.0021 0.0026 0.0014 0.0031 0.0014	59.8 2.21 1.4 4.16 2.17 0.018 0.13 0.09 0.0051 0.038 0.0068 0.0037 0.011 J 0.011
				SB-64 Tidal	0-0.5 Surface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Selenium No Exceedances No Exceedances Endrin aldehyde >C12-C28 Selenium No Exceedances No Exceedances alpha-BHC gamma-BHC No Exceedances	0.58 0.011 1.5 1.04 0.0021 0.0014	0.732 0.014 12 J 1.32 0.0072 0.002 J
					3.0-4.0 Shallow Soil	Metals VOCs SVOCs Pesticides/Herbicides			
					TPH				
					8.0-9.0 Subsurface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Selenium No Exceedances No Exceedances No Exceedances No Exceedances	1.04	1.93
SB-118	Evaluate extent of COPCs in shallow soil north of SB-62	Shallow Soil 0.5-5	Metals Arsenic Mercury Pesticides/Herbicides 4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Toxaphene SVOCs Benz(a)anthracene TPH >C12-C28	SB-62	0-0.5 Surface Soil 2.0-3.0 Shallow Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH Metals VOCs SVOCs Pesticides/Herbicides	Selenium No Exceedances No Exceedances No Exceedances No Exceedances Arsenic Mercury Manganese Selenium No Exceedances Benz(a)anthracene 4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin alpha-BHC beta-BHC delta-BHC gamma-BHC Toxaphene >C12-C28 Selenium No Exceedances No Exceedances No Exceedances No Exceedances	0.679 30.4 0.243 847 1.04 0.29 0.043 0.054 0.077 0.002 0.0021 0.0026 0.0014 0.0014 0.0024 1.5 1.04	0.839 50.4 0.727 952 2.26 0.41 0.28 0.12 3.4 0.15 0.0077 0.0029 0.0018 J 0.0025 J 0.22 15 J 1.93

Table 1
Soil PSV Exceedance Summary and Proposed Delineation Borings
WRN AOI-1-6
US Oil Recovery Superfund Site
Pasadena, TX

Proposed Delineation Boring	Objective	Proposed Intervals (depths are feet bgs)	Associated Perimeter Borings	Sample Depth (feet bgs) and Interval	COPC Group	Analyte PSV Exceedances (Proposed Analytes for Delineation Shaded Blue)	PSV (mg/kg)	Sample Concentration (mg/kg)
		Proposed Analytes						
SB-119	Evaluate extent of COPCs in surface, shallow and subsurface soil in the northeast slope area	Surface Soil 0-0.5	SB-82	0-0.5 Surface Soil 2.0-3.0 Shallow Soil	Metals VOCs SVOCs Pesticides/Herbicides	Arsenic Mercury Selenium No Exceedances No Exceedances 4,4'-DDD 4,4'-DDT Aldrin	8.43 0.243 0.679 0.043 0.03 0.002	41.5 0.725 1.35 0.34 0.55 0.0052
		Shallow Soil 0.5-5				No Exceedances No Exceedances		
		Subsurface Soil >5				4,4'-DDD 4,4'-DDT Aldrin No Exceedances		
						TPH		
						Metals VOCs SVOCs Pesticides/Herbicides	30.4 300 1.53 30 17.1 847 26 1.04 75 0.021 0.0033 0.3 0.00046 0.00023 0.053 0.0017 0.016 0.0079 0.015 0.026 0.043 0.054 0.077 0.002 0.0021 0.29 0.0026 0.0014 0.052 0.062 1.4 1.4 1.4 0.081 0.081 0.081 0.0014 0.013 0.046 0.002 2 0.0024 0.017	2640 434 2.02 940 60.3 1950 35.9 4.43 98.8 0.12 2.9 2.3 5.5 1.2 5.4 0.021 0.13 0.31 0.081 J 0.28 54 40 580 1.1 550 5.9 53 16 19 0.068 2.3 7 2.2 8.1 J 4.6 J 0.89 J 56 2.1 J 2.6 J 4.1 J 6.7 J 260 17 J
						TPH		
					Metals VOCs SVOCs Pesticides/Herbicides	Arsenic Boron Selenium Thallium No Exceedances No Exceedances No Exceedances No Exceedances Arsenic Mercury Antimony Boron Cobalt Selenium Thallium 1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2-Dichlorobenzene 1,4-Dichlorobenzene Benzene Chlorobenzene Ethylbenzene 1,1-Biphenyl 1,2,4,5-Tetrachlorobenzene 2,4,6-Trichlorophenol Isophorone 4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin alpha-BHC alpha-Chlordane beta-BHC delta-BHC Dieldrin Dinoseb Endosulfan I Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Endrin ketone gamma-BHC Heptachlor Heptachlor epoxide MCPA Methoxychlor Toxaphene C6-C12	8.43 30 0.58 0.103 30.4 0.243 1 30 17.1 0.735 0.014 0.021 0.99.3 1.51 0.168 J 1720 2.87 4.41 516 23.7 2.16 0.256 J 11 100 0.92 96 150 3.3 56 0.000061 0.022 0.0017 0.019 0.19 5 0.016 0.06 JL 0.0079 0.9 JL 0.12 JL 0.19 JL 0.0091 0.043 JL 0.11 0.15 JL	
						Metals VOCs SVOCs Pesticides/Herbicides TPH	39.7 99.3 1.51 0.168 J	
						Metals		
						VOCs		
						SVOCs		
						Pesticides/Herbicides		
						TPH		
						Metals		
						VOCs		
						SVOCs		
						Pesticides/Herbicides		
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						Pesticides/Herbicides		
						TPH		
						Metals		
						VOCs		
						SVOCs		
						Pesticides/Herbicides		
						TPH		
						Metals		
						VOCs		
						SVOCs		

Table 1
Soil PSV Exceedance Summary and Proposed Delineation Borings
WRN AOI-1-6
US Oil Recovery Superfund Site
Pasadena, TX

Proposed Delineation Boring	Objective	Proposed Intervals (depths are feet bgs)	Proposed Analytes	Associated Perimeter Borings	Sample Depth (feet bgs) and Interval	COPC Group	Analyte PSV Exceedances (Proposed Analytes for Delineation Shaded Blue)	PSV (mg/kg)	Sample Concentration (mg/kg)
SB-119 Continued	Evaluate extent of COPCs in surface, shallow and subsurface soil in the northeast slope area			SB-110 Continued	4.0-5.0 Shallow Soil Continued	Pesticides/Herbicides	4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin alpha-BHC alpha-Chlordane beta-BHC delta-BHC Dichlorprop Dieldrin Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Endrin ketone gamma-BHC gamma-Chlordane Heptachlor Heptachlor epoxide MCPA MCPP Methoxychlor Toxaphene C6-C12 >C12-C28	0.043 0.054 0.077 0.002 0.0021 0.29 0.0026 0.0014 0.23 0.0031 1.4 1.4 0.081 0.081 0.081 0.0014 0.23 0.00016 0.000078 0.002 8 2 0.0024 0.017 1.5	56 36 670 J 1.8 J 1000 6.3 J 87 56 14 J 12 6.2 3.9 J 1.3 J 5.3 J 1.1 J 300 10 5.7 1.6 J 1200 2700 23 290 J 42 J 520

Table 1
Soil PSV Exceedance Summary and Proposed Delineation Borings
WRN AOI-1-6
US Oil Recovery Superfund Site
Pasadena, TX

Proposed Delineation Boring	Objective	Proposed Intervals (depths are feet bgs)	Proposed Analytes	Associated Perimeter Borings	Sample Depth (feet bgs) and Interval	COPC Group	Analyte PSV Exceedances (Proposed Analytes for Delineation Shaded Blue)	PSV (mg/kg)	Sample Concentration (mg/kg)
SB-120	Evaluate extent of COPCs in the northeast slope area	Surface Soil 0-0.5	Full Analyte List	SB-109	0-0.5 Surface Soil	Metals	Arsenic Mercury Manganese Selenium Chromium	8.43 0.243 997 0.679 30	68.9 0.313 1120 1.93 30.3
		Shallow Soil 0.5-5	Full Analyte List			VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances No Exceedances No Exceedances No Exceedances		
		Subsurface Soil >5	Full Analyte List		3.0-4.0 Shallow Soil	Metals	Arsenic Mercury Antimony Barium Boron Cadmium Manganese Selenium	30.4 0.243 1 300 30 1 847 1.04	1640 88.7 4.62 317 81.8 1.13 1400 3.1
						VOCs	1,2,4-Trichlorobenzene 1,2,4-Trimethylbenzene 1,4-Dichlorobenzene	0.0033 0.021 0.00046	0.097 0.031 0.73
						SVOCs	Benzene Chlorobenzene Ethylbenzene Hexachlorobutadiene	0.00023 0.053 0.0017 0.0091	0.16 3.6 0.014 0.035
						Pesticides/Herbicides	4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin alpha-BHC alpha-Chlordane beta-BHC delta-BHC Dieldrin Endrin Endrin aldehyde Endrin ketone gamma-BHC gamma-Chlordane Heptachlor Heptachlor epoxide Toxaphene C6-C12 >C12-C28	0.043 0.054 0.077 0.002 0.0021 0.29 0.0026 0.0014 0.052 0.081 0.081 0.081 0.0014 0.23 0.013 0.046 0.0024 0.017 1.5	120 JH 15 JH 140 JH 0.025 JH 0.12 JH 3.2 JH 0.58 JH 0.091 JH 13 JH 1 JH 0.25 JH 0.91 JH 0.035 JH 3.1 JH 0.077 JH 0.76 JH 78 JH 15 J 210
SB-121	Evaluate extent of COPCs in surface and shallow soil west of SB-47, SB-48 and SB-73	Surface Soil 0-0.5	Metals Arsenic Mercury	SB-47	0-0.5 Surface Soil	Metals	Selenium Zinc	0.679 416	0.931 455
		Shallow Soil 0.5-5	Metals Arsenic Mercury Pesticides/Herbicides Aldrin alpha-BHC			VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances No Exceedances No Exceedances No Exceedances		
					1.0-2.0 Shallow Soil	Metals	Selenium	1.04	1.2
						VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances No Exceedances No Exceedances		
						Pesticides/Herbicides	Aldrin	0.002	0.0083
						TPH	No Exceedances		
				SB-48	0-0.5 Surface Soil	Metals	Arsenic Mercury Selenium	8.43 0.243 0.58	10.7 0.253 1.26
						VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances No Exceedances No Exceedances No Exceedances		
					4.0-5.0 Shallow Soil	Metals	Mercury	0.243	0.396
						VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances No Exceedances No Exceedances No Exceedances		
				SB-73	0-0.5 Surface Soil	Metals	Arsenic Selenium	8.43 0.679	9.94 1.12
						VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances No Exceedances No Exceedances		
					3.0-4.0 Shallow Soil	Metals	Aldrin alpha-BHC	0.002 0.0021	0.0078 0.023
						VOCs SVOCs Pesticides/Herbicides TPH	No Exceedances		

Table 1
Soil PSV Exceedance Summary and Proposed Delineation Borings
WRN AOI-1-6
US Oil Recovery Superfund Site
Pasadena, TX

Proposed Delineation Boring	Objective	Proposed Intervals (depths are feet bgs)	Proposed Analytes	Associated Perimeter Borings	Sample Depth (feet bgs) and Interval	COPC Group	Analyte PSV Exceedances (Proposed Analytes for Delineation Shaded Blue)	PSV (mg/kg)	Sample Concentration (mg/kg)
SB-122	Evaluate extent of COPCs in surface and shallow soil west of SB-6, SB-8 and SB-83	Surface Soil 0-0.5	Metals Arsenic Mercury Pesticides/Herbicides 4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin beta-BHC Dieldrin Endrin Aldehyde	SB-6	0-0.5 Surface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Arsenic Selenium No Exceedances No Exceedances No Exceedances No Exceedances	8.43 0.679	9.74 1.02
							Selenium 1,4-Dichlorobenzene No Exceedances	1.04 0.00046	1.1 0.02
		Shallow Soil 0.5-5	Metals Arsenic VOCs 1,4-Dichlorobenzene Pesticides/Herbicides Aldrin	SB-8	0-0.5 Surface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Aldrin No Exceedances	0.002	0.0056
							Selenium Mercury Antimony Selenium No Exceedances No Exceedances	8.43 0.243 1 0.679	33.6 0.248 14.2 1
							4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin beta-BHC Dieldrin Endrin aldehyde No Exceedances	0.043 0.054 0.03 0.002 0.0026 0.052 0.011	0.046 JL 0.31 JL 0.044 JL 0.017 JL 0.0096 JL 0.1 JL 0.018 JL
		3.0-5.0		SB-83	0-0.5 Surface Soil	Metals VOCs SVOCs Pesticides/Herbicides TPH	Selenium No Exceedances No Exceedances No Exceedances No Exceedances	1.04	1.19
							No Exceedances	0.679	0.73
							Metals VOCs SVOCs Pesticides/Herbicides TPH	0.002	0.0047
							Aldrin No Exceedances		
							No Exceedances		

Notes:

Proposed delineation borings shown on Figure 1

COPC - Chemical of Potential Concern

PSV - Preliminary Screening Value (lower of applicable human health or ecological PSV)

VOCs - Volatile Organic Compounds

SVOCs - Semi-Volatile Organic Compounds

TPH - Total Petroleum Hydrocarbons

bgs - below ground surface

mg/kg - milligrams per kilogram

-- not analyzed; boring part of historic pit delineation

Table 2
Proposed Delineation Wells and Groundwater Data Exceedance Summary for Perimeter Monitoring Wells
US Oil Recovery
Pasadena, Texas

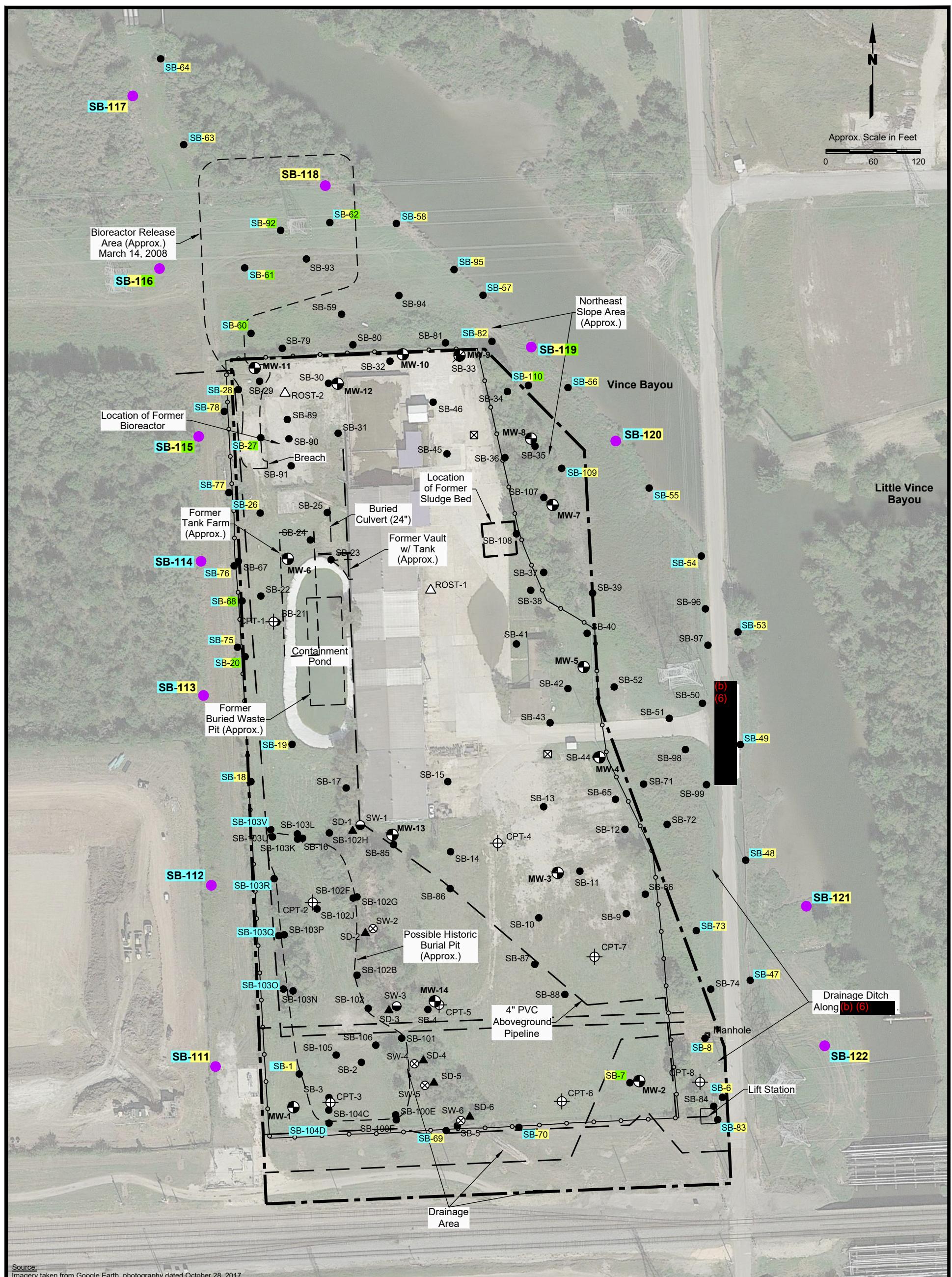
Proposed Delineation Monitoring Well	Objective	Proposed Analytes	Associated Monitoring Well	COPC Group	Analytes Exceeding PSVs	PSV (mg/L)	Concentration (mg/L)
MW-16	Evaluate extent of COPCs east of MW-7 in northeast slope area	Full Analyte List	MW-7	Metals VOCs SVOCs Pesticides and Herbicides TPH	Arsenic Boron 1,2-Dichloroethane 1,4-Dioxane Aldrin alpha-BHC beta-BHC Dieldrin gamma-BHC <i>No Exceedances</i>	0.01 4.900 0.005 0.00091 0.0000054 0.0000140 0.0000510 0.0000057 0.0002000	43.9 9.94 0.091 0.0038 JL 0.000069 J 0.0035 0.0056 0.00011 J 0.0011
MW-15	Evaluate extent of COPCs east/downgradient of MW-8 in northeast slope area	Full Analyte List	MW-8	Metals VOCs SVOCs Pesticides and Herbicides TPH	Manganese 1,2-Dichloroethane 1,4-Dioxane Aldrin beta-BHC Dieldrin gamma-BHC <i>No Exceedances</i>	1.1 0.005 0.00091 0.0000054 0.000051 0.0000057 0.0002	4.29 0.17 0.0089 JL 0.000049 JH 0.0046 JH 0.00042 JH 0.00087 JH
MW-9	Replace MW-9 and evaluate extent of COPCs northeast/downgradient or MW-10	Full Analyte List	MW-10	Metals VOCs SVOCs Pesticides and Herbicides TPH	Boron Manganese 1,4-Dichlorobenzene Benzene Chlorobenzene <i>No Exceedances</i> 4,4'-DDT Dieldrin gamma-BHC Heptachlor epoxide MCPPA MCPP C6-C12 >C12-C28	4.9 1.1 0.075 0.005 0.1 0.0003 0.0000057 0.0002 0.0002 0.012 0.024 0.98 0.98	6.19 1.91 1 0.12 1.8 0.00036 JH 0.00079 JH 0.013 JH 0.00065 JH 3 J 0.314 J 2.5 1.2

Notes:

Proposed monitoring well locations are shown on Figure 2

PSV - Preliminary Screening Value, which is the lower of the EPA Maximum Contaminant Level or the applicable TCEQ Protective Concentration Limit

FIGURES



Source:
Imagery taken from Google Earth, photography dated October 28, 2017.

EXPLANATION

- - - Approx. Property Boundary
- - - Approx. Security Fence
- - - Approx. Pipeline Location
- Soil Boring Location per RI/FS Work Plan (Source Areas/Industrial Activities)
- Soil Boring Location per RI/FS Work Plan (Drainage Areas)
- Surface Water Sample Location
- Surface Water Sample Location - Not Collected due to absence of Surface Water
- ▲ Sediment Sample Location
- Monitoring Well Location
- CPT Location
- △ CPT/ROST Location
- ☒ CPT Location - Eliminated due to Underground Obstruction
- Monitoring Well Not Installed Due to Presence of Saturated Fill Material
- Proposed Soil Boring Location

**Soil Exceedances
(Existing Soil Boring Locations)
and Proposed Sampling Intervals
(Proposed Soil Boring Locations)**

- Surface Soil
- Shallow Soil
- Subsurface Soil

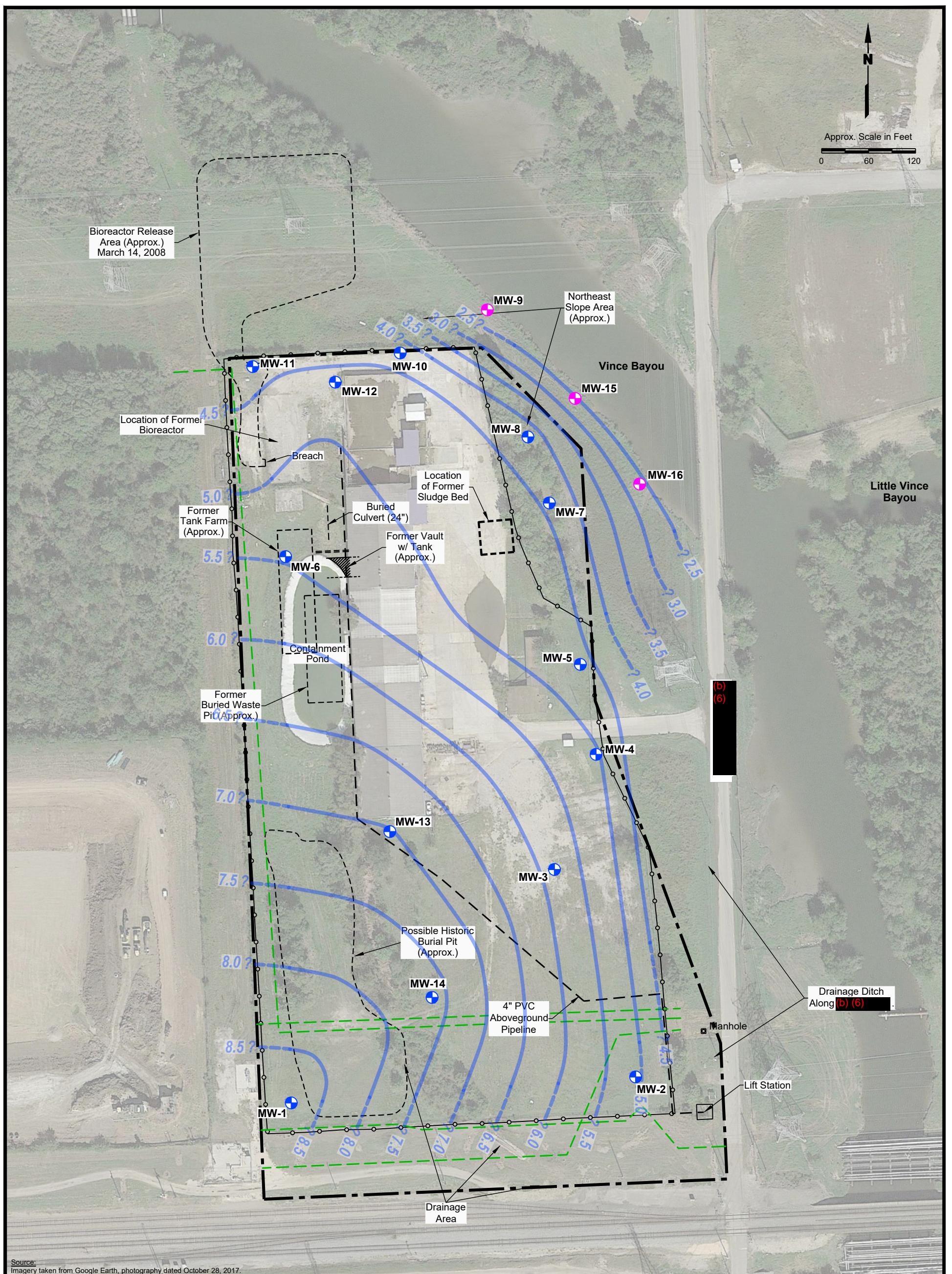
US OIL RECOVERY SUPERFUND SITE PASADENA, HARRIS COUNTY, TEXAS

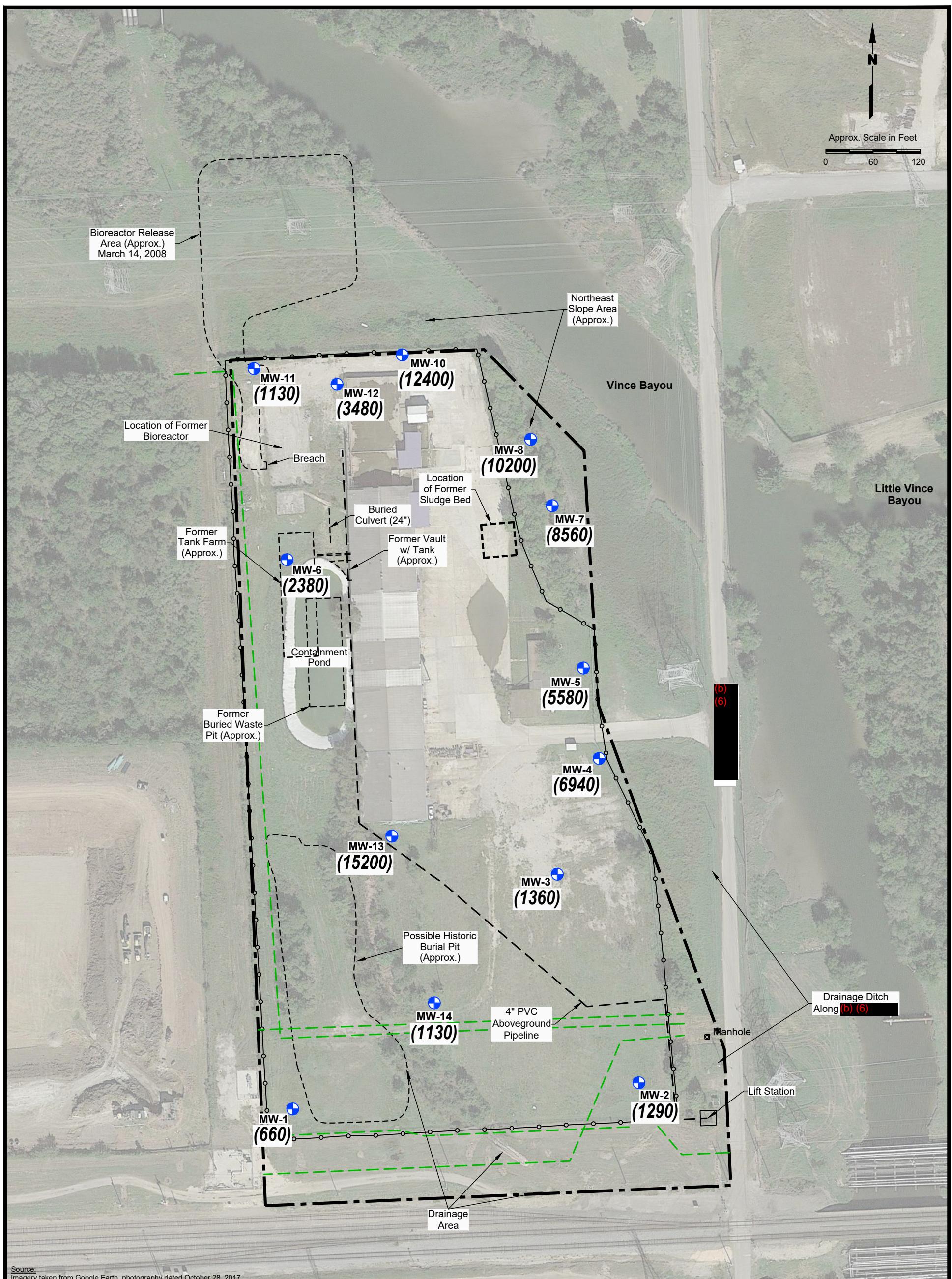
Figure 1

EXTENT EVALUATION AND PROPOSED SOIL BORING LOCATION MAP

PROJECT: 3333	BY: AJD	REVISIONS
DATE: NOV., 2017	CHECKED: MKW	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS





Source:
Imagery taken from Google Earth, photography dated October 28, 2017.

EXPLANATION

- — Approx. Property Boundary
- Approx. Security Fence
- Approx. Pipeline Location
- Monitoring Well Location
- (660) TDS Concentration (mg/L)
(Samples collected July 20-24, 2017)

US OIL RECOVERY SUPERFUND SITE PASADENA, HARRIS COUNTY, TEXAS

Figure 3

TOTAL DISSOLVED SOLIDS CONCENTRATIONS IN GROUNDWATER SAMPLES

PROJECT: 3333	BY: AJD	REVISIONS
DATE: NOV., 2017	CHECKED: MKW	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS